# Identifying Measurable Administrative Indicators

It has been argued that through all three of their mission programs—teaching, research, and extension—the 1890s build human capital in traditionally underserved areas (see, for example, Williams, 1973; Brazziel, 1983; Parks, 1985; Williams and Williamson, 1985; Allen, 1990; Davis, 1992; Evans et al.; and Polopolus, 1990). Yet, little measurable empirical evidence exists of the private or social benefits generated by teaching, research, or extension activities of the 1890 universities. There has been no systematic effort to measure the economic contribution of the 1890s' programs to human capital development or to improving the well-being of the population they serve.

In the parlance of some management systems, outcomes are benefits that accrue to individuals and society when people participate in a program. They may take the form of enhanced learning (knowledge, perceptions/attitudes, or skills); increased income; or a change in conditions, such as improved health, from the adoption of a desired behavior or practice. Indicators are measurable events accepted as evidence that an outcome has been achieved.

Contributions to social welfare made by educational institutions are difficult to measure. For example, a college or university may create an atmosphere that is especially welcoming to minority students, thereby encouraging some students to attend college who otherwise might not (LeBlanc, 1996). Usual indicators of educational output such as test scores may not capture such contributions. Similarly, not all R&D contributions may be captured by standard measures of research output such as patent or publication counts. Indicators that do not take these types of contributions into account may underestimate total benefits.

## **Teaching Outcomes and Indicators**

In 1993-94, the Historically Black Colleges and Universities (HBCUs) awarded 28 percent of bachelor's, 15 percent of master's, 9 percent of doctorate, and 16 percent of first-professional degrees to Blacks in the United States (National Center for Education Statistics, 1996). The 1890s institutions are a subset of the HBCUs and play an important role in educating African-Americans.

The 1890 land-grant universities account for a third of all African-American students enrolled in HBCUs and

have played a significant role in training students from various ethnic minorities in agricultural and food sciences, engineering, mathematics, and other disciplines. In 1993 about 20 percent of minority students pursuing bachelor's degrees in agriculture and natural resources specializations were enrolled at 1890 colleges (National Research Council, 1995). Moreover in 1994, 16 percent of all African-American students enrolled in U.S. institutions of higher education were enrolled at 1890s.

The 1890 land-grant institutions play a significant role in educating minority students for professions in agriculture and related fields. During the 1970s, approximately 80 percent of the students enrolled in agriculture at the 1890 institutions were non-White, compared with only 5 percent at 1862 institutions (Hytche, 1992). In the 1980s, the 1890 institutions accounted for about 35 percent of all minorities enrolled in agriculture-related

Table 7—Administrative outcomes and indicators for teaching

Outcomes	Indicators
Outcomes	indicators
Matriculation	Numbers and proportions of:  students who return to complete their degree program  students graduating with different levels of degrees  ethnic minorities graduated
Employment	Income earned by graduates
	Numbers and proportions of:  graduates employed in USDA graduates employed in agriculture graduates employed in their field
Professional/ leadership achievement	Numbers and proportions of graduates:  pursuing graduate or professional studies  with advanced degrees in leadership roles  active in their professional and/or community organizations  indicating education key to contributions as citizens and or in their professions
Personal satisfaction	Number and proportion of graduates who:  return to the same institution at a higher program level are active in alumni associations recruit and/or recommend others to their alma mater contribute financially to alma mater

Source: Essel, Clarke, and Tegene, 1999.

fields and graduated about 65 percent of African-American recipients of bachelor's degrees in agricultural sciences. The 1890 institutions continued to be a significant source of minority graduates in the 1990s.

The schools and colleges of agriculture, forestry, and renewable natural resources at these institutions offer both undergraduate and graduate degree programs. Minority students in baccalaureate programs at these schools and colleges specialize in a wide range of areas, although many seem to find a few areas, such as animal sciences and agricultural business and management, most attractive (see appendix tables B6-B7).

The specific outcomes of teaching programs at the schools/colleges of agriculture in the 1890 land-grant institutions depend on the particular goals and objectives established for these programs by the institutions, by State and Federal agencies funding the programs, and by stakeholders. However, based on the fundamental objective of the 1890 land-grant teaching program—to prepare students to become productive citizens capable of reaching their full potential—the outcomes of USDA-supported 1890 teaching programs in food and agricultural sciences could be measured by the number of graduates who obtain degrees in food and agricultural sciences; gain admission to graduate/professional school; secure employment; attain career/professional goals; and become leaders in their professions, communities, country, and the world.

Each of these outcomes can be measured by a number of indicators. For example, matriculation can be measured by the number and percent of students graduated with different levels of degrees and/or the number and percent of African-American and other ethnic minorities graduated. Outcomes are often multi-dimensional and not easily represented by a single indicator. Table 7 provides some examples of potential outcomes and indicators that might be used to measure the performance of 1890 institutions in the area of teaching. Most outcomes and indicators should be compared to graduates from similar programs in other institutions and graduates from 1862 and non-land-grant institutions adjusted for regional and social differences.

## Research Outcomes and Indicators

Agricultural research at the 1890 institutions is facilitated by the Association of Research Directors, Inc. (ARD), a federation of the research directors from the seventeen 1890 land-grant universities that provides coordination of research initiatives among member

Table 8—1890s research expenditures by ESCOP<sup>1</sup> Program areas, 2000

Research area	\$1,000	Percent
Environment and natural resources	6,171	16.5
Plant systems	8,975	24.0
Animal systems	9,241	24.7
Food and non-food products	2,129	5.7
Engineering	846	2.3
Economics, markets, and policy	2,544	6.8
Human nutrition and food safety	4,901	13.1
Family and community systems	1,628	4.4
Research support, administration	920	2.5
Total	37,355	100

<sup>&</sup>lt;sup>1</sup> Experiment Station Committee on Organization and Policy.
Sources: Cooperative State Research, Education, and Extension Service (CSREES). Data based on USDA's Current Research Information System (CRIS).

institutions in cooperation with Federal, State, and private partners. ARD partners with USDA's Cooperative State Research, Education, and Extension Service (CSREES) and holds membership in the State Agricultural Experiment Station System (SAES) of the National Association of State Universities and Land-Grant Colleges (NASULGC). It also cooperates with other regional, national, and international committees, organizations, and groups in developing programs and legislation affecting the food and agricultural research needs of the Nation.

Research priorities at 1890s are determined by Federal, State, and local priorities and needs, which are heavily influenced by stakeholders. However, the fundamental food and agricultural research mission of the 1890s is to ensure a safe, affordable, and ample food and fiber supply; to promote a sustainable environment; to conserve natural resources; and to contribute to the improvement in the socioeconomic well-being and overall quality of life of diverse rural and urban populations (Mayberry, 1976; and Mayes, 1992).

The 1890s have developed research programs in animal science, crop science, natural resources, human health and nutrition, and rural development. In addition, research at the 1890s has addressed the problems and concerns pertinent to small-scale farmers and limited-resource families, including, for example, research on minor livestock species, such as goats and rabbits, that are particularly suited to small-farm operations.

Current primary research areas at 1890 institutions include economically competitive and sustainable small-scale production systems; improved plant, animal, and aquaculture production systems; crop diversity and alternative crops and marketing strategies for farmers; food safety and quality; family and community development; protection and improvement of water quality and quantity; environmental pollution and waste management, value-added plant and animal products, and improved nutrition and health (Mayes, 1992).

Apportioning credit for observed changes to research conducted at specific institutions, or even to research in general, is difficult. For example, how might one partition the value of an increase in the agricultural productivity in the United States among contributions from 1862 land-grants, 1890 land-grants, and other public and private research institutions? Particularly for the 1890s, because research and development expenditures are relatively small portions of total agricultural R&D expenditures in the United States, estimating a statistical relationship between agricultural productivity or other advancements in the agricultural sector and funding in these institutions becomes nearly impossible.

It may be difficult to estimate the contribution of 1890s to changes like overall productivity growth, but each institution's output or research outcome can be identified. In one approach, the Experiment Station Committee on Organization and Policy (ESCOP) has designed 9 general areas to identify research outcomes: environment and natural resources; plant systems; animal systems; food and non-food products; engineering; economics, markets, and policy; human nutrition and food safety; family and community systems; and research support and administration. Since 1890s spend about 65 percent of their research funds in the areas of animal/plant systems and environmental and natural resources research (table 8), outcomes in these research areas are particularly important.

Within these broad categories of research, potential outcomes include new understanding of efficient use of land and water resources with environmentally friendly farming practices; new information on healthy and optimal nutritional requirements of individuals and knowledge of enhanced food safety measures; new and/or improved byproducts; new knowledge of effective strategies for strengthening communities and improving quality of life for rural communities; new

information on profitable use of feed grains, pasture, forage, and other crop byproducts for producing minor livestock species particularly suitable for small farmers; improved quality of animal production systems and animal food products; and knowledge of new and cost-effective techniques for plant breeding, sustained productivity of plants, and improved plant management systems.

Traditional indicators of research outcomes depend heavily on publication and/or patent counts. Common indicators of research outcomes include the number of products/patents produced; number of journal articles, books, and monographs published; number of research reports, staff papers, or working papers written; number of conference papers presented; number of copyright notices filed; and/or number of refereed journal articles identified in citation indexes.

## **Extension Outcomes and Indicators**

The Cooperative Extension Service is an outreach and education program designed to enable people to improve their lives through scientific knowledge adapted and applied to their everyday issues and needs (National Research Council, 1995: p. 68). The impetus for the Federal extension initiative stemmed from concerns in the early 1900s that knowledge and technologies being developed at the State agricultural experiment stations and USDA were not reaching those farmers and citizens not enrolled in the land-grant colleges. Congress addressed these concerns with the passage of the Smith-Lever Act of 1914 that established the Extension Service as a cooperative effort among Federal, State, and county governments on a nation-wide basis.

The 1890 universities began their outreach program for Black farmers shortly after the universities' establishment. The "farmers conference" in 1892 and the "short course in Agriculture" offered by Tuskegee (and soon followed by other 1890s) are considered to be the beginning of Black agricultural extension work (Neyland, 1990, p. 149-151). As early as 1906, Tuskegee's "movable school" or "traveling school" taught Black farmers better ways of farming by using field demonstrations, a model soon adapted for use across the Cooperative Extension System. Today, the 1890 extension system is part of a nationwide Cooperative Extension System that encompasses the land-grant universities, the U.S. Department of Agriculture, and county governments.

### Table 9—Extension outcomes and indicators

## **Outcomes**

Farmers make decisions that enhance profitability.

Farmers adopt production practices that enhance income, environmental quality, and their communities.

Households have increased knowledge of family resource management and childcare providers improve the quality of care given to children.

Farmers are more knowledgeable about government, education, strategic planning, and their communities.

Source: Essel, Clarke, and Tegene, 1999.

The 1890 institutions have targeted their extension programs toward limited-resource and underserved populations. Historically, these audiences lacked access to other non-formal educational opportunities because they were hard to reach; had distinct problems associated with their poverty, minority status, and scale of farming; and presented little or no economic incentives to private sector suppliers. In 1998, the Association of Extension Administrators (AEA) published a strategic plan to guide extension work at the 1890 institutions in the 21st century. In this plan, the AEA identified the special mission of the 1890 Extension System as assisting "diverse audiences, with emphasis on those who have limited social and economic resources, to improve their access to positive opportunities through outreach education."

Extension programs commonly focus on seven base areas (National Research Council, 1995): agricultural competitiveness and profitability, community resource and economic development, family development and resource management, 4-H and youth development, leadership and volunteer development, natural

### **Indicators**

Number of informal small-farm profitability and sustainability education programs conducted, number of producers and landowners participating in non-formal educational program, and number of producers adopting recommended farm business management practices such as strategic planning and risk management.

Number of producers adopting production practices and alternatives that are profitable and promote quality of soil, water, and air resources; number of farmers adopting new and value-added enterprises; number of farmers adopting cost-saving practices; and number of farmers developing and implementing marketing plans. Dollar value of new and value-added products produced, savings from adopting improved management practices, and additional income from farming.

Number of childcare providers receiving training, number/percent of participating childcare providers adopting recommended quality childcare practices, number of participants starting new childcare business as a result of training, number of people participating in household resources/financial management program, and dollars saved by adopting the new resource/financial management strategies.

Number of participants in the community leadership programs, number of participants who serve (attend) and/or plan to serve (attend) community activities such as school board, governing board, or planning commission board in their community, number of participants who are appointed to leadership roles at all levels of the community, and number of participants who report increased knowledge and understanding of the economic development plan for their community.

resource and environmental management, and nutrition, diet and health.

The customer needs of each State determine the areas of each land-grant institution's educational priorities, but many 1890 institutions offer extension programs in most of these areas. For each area, institutions develop program plans that identify goals and objectives, including activities needed to achieve them. Ideally, for each objective, the program plan defines outcomes desired, indicators for measuring these outcomes, and evaluation methods that may be used to gather information.

Extension programs help a target audience find solutions to a defined problem in a systematic and sequential educational process. They create opportunities for people or communities with a problem to progress from awareness to increased knowledge and skills to adoption of a desired behavior. To meet the educational mandates of stakeholders and funding sources, extension programs must establish goals and objectives that stimulate outcomes which ultimately result in a

desired personal and societal change. These outcomes may include improved quality of life for individuals and families, more productive farms and forests, and enhanced environmental conditions in urban and rural communities.

Determining the value of extension programs will require the collection of quantitative and qualitative data on outcomes and indicators. Rennekamp, Warren, and Maurer (1996) have listed seven levels of data that can be collected about outcomes of an Extension program, in order of their usefulness in documenting outcomes. These levels are changes in social, economic, or environmental conditions; things participants are doing differently as a result of the program; changes in knowledge, opinions, skills, or aspirations; participants' feeling about the program; number of people who participated in the program; what was done and the interactions of the participant with the educator; and resources expended for the program. The highest levels reflect changes in participant behavior and social impacts. However, as noted by the Greater Kalamazoo Evaluation Project (Spring 1998), measuring behavioral changes of program participants poses serious challenges. At best, any such behavioral outcome measurements are only approximations.

In the past, the Extension Service has been effective in documenting and reporting program inputs, activities, and outputs (number of people participating, number of workshops and meetings held, number of educational materials distributed, number of hours of volunteer service delivered, etc.), but have been less effective in documenting outcomes. With increased demands for accountability from governments, other funding agen-

cies, clients, and stakeholders, Extension is challenged to develop meaningful outcomes and measures for its programs that allow for adequate determination of their effectiveness and returns on public investments (National Research Council, 1996).

Valuing the economic benefits of 1890 extension programs will require collecting data on inputs, activities, outputs, and outcomes of all the different outreach and educational programs offered by the 17 institutions that comprise the 1890 Extension System. Rennekamp, Warren, and Maurer (1996) provide a detailed description of some of the methods and approaches that can be used in gathering such data.

Because quantitative data are easier and more amenable to mathematical analysis, program planners and evaluators tend to prefer to obtain such data for measuring educational impacts. For example, the number of people affected by an extension program is usually used as a gauge for the program's effectiveness. Unfortunately, this method often leaves out qualitative impact information. In addition, it may not necessarily provide a good guide in determining which projects are having the largest impacts. A program that affects 100 people significantly (however significance is measured) may be a better use of funds than a program that affects 1,000 people only slightly. Just focusing on quantitative data and modeling may fail to capture the greatest outcomes that extension programs can have on people's quality of life. Although qualitative measures are imprecise and difficult to evaluate economically, valuing the return on investment in 1890 extension programs must inevitably include a qualitative component.